

What is claimed is:

1. A method for removing calcium from a hydrocarbonaceous material comprising:
  - 5 a) contacting a hydrocarbonaceous material with an extraction solution, which comprises acetate ion and has a pH in the range of between 3.0 and 5.0, to form a multi-phase mixture;
  - b) maintaining the multi-phase mixture at extraction conditions, including a temperature within the range of 25°C and 200°C, for a time sufficient to remove at least a portion of the calcium present in the hydrocarbonaceous material; and
  - 10 c) separating the multi-phase mixture into at least a calcium-enriched aqueous mixture and a calcium-reduced hydrocarbonaceous material.
2. The method of Claim 1, wherein the extraction solution is prepared by blending acetic acid with an aqueous solution of an alkaline material.
- 15 3. The method of Claim 2, wherein the alkaline material is selected from the group consisting of sodium hydroxide, ammonium hydroxide, ammonia, potassium hydroxide and mixtures thereof.
4. The method of Claim 3, wherein the alkaline material is ammonium hydroxide.
5. The method of Claim 1, wherein the multi-phase mixture is maintained at a temperature within the range of 110°C and 175°C for a time of between about 1 minute and about 1 hour.
- 20 6. The method of Claim 1, wherein the extraction solution has a pH in the range of between 3.1 and 4.7.
7. The method of Claim 1, wherein the extraction solution has a pH in the range of between 3.5 and 4.6.
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8. The method according to Claim 1, wherein the extraction solution contains at least 2 moles of acetate ion per mole of calcium contained in the hydrocarbonaceous material.
9. The method according to Claim 1, wherein the extraction solution contains in the  
5 range of 4 moles to 9 moles of acetate ion per mole of calcium contained in the hydrocarbonaceous material.
10. The method according to claim 1, wherein the multi-phase mixture is maintained at extraction conditions sufficient to remove at least 60 percent by weight of the calcium contained in the hydrocarbonaceous material.
- 10 11. The method according to Claim 10, wherein the extraction conditions include a temperature within the range of 110°C and 200°C for a time between about 1 minute to about 1 hour.
12. The method according to Claim 10, wherein the extraction conditions include a  
15 temperature within the range of 25°C and 110°C for a time between of about 1 second and about 4 hours.
13. The method of Claim 1, wherein the multi-phase mixture has a composition of at least 2 parts by weight of extraction solution per 100 parts by weight of hydrocarbonaceous material.
14. The method of Claim 1, wherein the hydrocarbonaceous material is selected from  
20 the group consisting of a crude oil, a residuum fraction, a vacuum residuum fraction, a deasphalted oil and a SDA tar.
15. The method of Claim 1, wherein the hydrocarbonaceous material contains greater than 50 ppm calcium.
16. The method of Claim 1, wherein the hydrocarbonaceous material contains greater  
25 than 100 ppm calcium.
17. The method of Claim 1, wherein the extraction solution further comprises at least one additive selected from the group consisting of an extraction additive and a demulsifier.

18. A method for removing calcium from a hydrocarbonaceous material comprising:
- a) blending acetic acid with an alkaline material to produce an extraction solution having a pH in the range of between 3.0 and 5.0;
  - b) combining a calcium-containing hydrocarbonaceous material, with sufficient extraction solution to provide at least one mole of acetate ion per mole of calcium in the hydrocarbonaceous material, to form a multi-phase mixture;
  - c) maintaining the multi-phase mixture at a temperature in the range of 25°C to 200°C for a sufficient time to remove at least a portion of the calcium contained in the hydrocarbonaceous material into the extraction solution; and
  - d) separating a calcium-enriched aqueous mixture from a calcium-reduced hydrocarbonaceous material.
19. The method of Claim 18, wherein the extraction solution has a pH in the range of between 3.1 and 4.7.
20. The method of Claim 19, wherein the extraction solution has a pH in the range of between 3.5 and 4.6.
21. The method of Claim 18, wherein the multi-phase mixture comprises at least 2 parts by weight of extraction solution per 100 parts by weight of hydrocarbonaceous material.